

REMARKS

Prior to this communication, claims 1-46 are pending in the application.

In the pending action, the Office allowed claims 19-31; objected to claims 3-7, 10, 14, 16, 17, 39, 41-43, 45, and 46; and rejected claims 1, 2, 8, 9, 11-13, 15, 18, 32-38, 40, and 44.

By this Amendment, Applicants are amending claims 1-3, 5-8, 10, 22, 23, 32, 38, 40, 41, and 45; and adding claims 47 and 48. Reexamination and reconsideration in view of the amendments and remarks contained herein are respectfully requested.

Claim 10 was objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants have amended claim 10 into independent form including all of the limitations of the base claim 1. Accordingly, claim 10 is allowable.

Applicants amended claims 3, 6-8, and 10 to correct antecedent basis errors.

Applicants amended claim 40 to correct a minor informality.

Applicants amended claims 5-7, 22, 23, and 41 by amending the word "is" to "includes."

Claims 1, 2, 8, 9, 11, and 15 stand rejected under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Patent No. 5,687,737 (Branham). Amended claim 1 is repeated below for the Examiner's reference.

1. (Currently amended) A method of displaying a representation of a physiological signal produced by an organ of interest of the patient, the method comprising the acts of:
 - obtaining a portion of at least one physiological signal, the obtaining act including acquiring the at least one physiological signal from the exterior of the patient;
 - determining an area to display;
 - constructing a virtual image including (M) polygonal areas;
 - transforming the obtained signal to a plurality of values;
 - assigning each value to one of the (M) polygonal areas;
 - assigning a visual characteristic to each polygonal area based in part on the assigned values; and

displaying at least a portion of the virtual image including the assigned visual characteristics.

Branham does not teach or suggest a method of displaying a representation of the physiological signal produced by an organ of interest of the patient as recited in amended claim 1. Rather, Branham provides a slow-motion rotatable visual display, on a computer screen, using three-dimensional surface models, of the depolarization wavefronts on the exterior and interior surfaces of a heart. “This computerized depiction is generated by a digital computer with appropriate software, coupled to an electrode array that is direct contacting a beating heart while the patient is under anesthesia.” (Emphasis added.) Col. 1, lines 20-24. See also col. 7, lines 42-48; col. 10, lines 53-59; and Fig. 1. Therefore, Branham clearly describes acquiring the physiological signal by placing one or more sensors (e.g., an electrode array) in direct contact with the organ of interest (i.e., the beating heart). Therefore, Branham does not teach or suggest the subject matter of claim 1.

In addition, amended claim 1 is not obvious in view of the Branham reference. More specifically, the Branham reference teaches away from the claimed invention by having the electrode array directly contacting the heart. Accordingly, Applicants request withdrawal of the rejection and allowance of claim 1.

Claims 2-9 and 11-18 depend, either directly or indirectly, from claim 1 and consequently, include patentable subject matter for the reasons set forth above with respect to claim 1. Therefore, dependent claims 2-9 and 11-18 are allowable. Additionally, dependent claims 2-9 and 11-18 specify additional acts and/or limitations that, in combination with claim 1, are believed to be inventive. For example, the Examiner has indicated claims 3-7, 10, 14, 16, and 17 include allowable subject matter. Additional discussion regarding some of the rejected dependent claims is provided below.

Amended claim 2 further specifies placing a plurality of electrodes on the exterior of the patient. Amended claim 8 further specifies attaching a sensor to the exterior of the patient. Branham, on the other hand, describes directly coupling an electrode array to a beating heart. Accordingly, dependent claim 2 includes allowable subject matter.

Claim 11 specifies that the virtual image represents at least a portion of the body surface of the patient. Branham clearly describes a slow-motion rotatable visual display, on a computer screen, using three-dimensional surface models, of the depolarization wavefronts of the exterior and interior surfaces of a heart. See, for example, col. 1, lines 16-20. Therefore, dependent claim 11 includes allowable subject matter.

Claims 32, 38, 40, and 44 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,474,078. For establishing a *prima facie* case of obviousness, three basic criteria must be met. M.P.E.P. § 2143. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must be both found in the prior art, not in Applicants' disclosure. M.P.E.P. § 2143. Applicants assert that the Examiner has not established a *prima facie* case of obviousness. For example, the Examiner has not set forth what elements are taught by Hutson and what elements are not taught by Hutson. Moreover, the Examiner has not set forth any motivation why the steps not taught by Hutson can be combined with the Hutson reference, and that it would be reasonable to expect success with the combination. Therefore, the Examiner has not set forth a *prima facie* case of obviousness. Accordingly, Applicants traverse the Examiner's rejection.

However, in the interest of expediting prosecution, Applicants' representative has reviewed the reference, amended claim 32 to more clearly define the invention, and is setting forth arguments below why the claims are not obvious in view of the Hutson reference. Amended claim 32 is repeated below for the Examiner's reference.

32. (Currently amended) A method of analyzing a physiological signal produced by a patient and generating an optimal set of signals for particular diagnosis, the method comprising the acts of:
- obtaining (N) voltages from (N) signals, respectively, the (N) signals representing the physiological signal, (N) being greater than one;
 - converting the (N) voltages to (M) values, where (M) is greater than (N);
 - optimizing the (M) values to (P) values, where (P) is less than (M).

Hutson does not teach or suggest a method of analyzing the physiological signal produced by a patient and generating an optimal set of signals for particular diagnosis as recited in claim 32. With reference to claim 32, the method obtains (N) voltages from (N) signals, respectively, where the (N) signals represent the physiological signal, and where (N) is greater than one. See, for example, page 7, line 25 to page 8, line 18. The (N) voltages are then converted to (M) values, where (M) is greater than (N). See, for example, page 9, line 13 to page 10, line 7. After converting to (M) values, the method optimizes the (M) values to (P) values, where (P) is less than (M). See, for example, page 10, line 5 to page 14, line 16.

Referring now to Hutson, Hutson describes obtaining data for multiple ECG leads in the form of a three-dimensional matrix. See, for example, Fig. 5, and col. 7, lines 35-58. Hutson then processes the data as is shown in Fig. 6.

Fig. 6 shows a flow chart for the main algorithm 60. The algorithm operates on three-dimensional ECG input data (box 61). Initially, three-dimensional ECG input data (as shown in FIG. 5) is obtained, weighted, and reformatted into one or more two-dimensional matrices by a Preprocessing Function (box 62). The Subspace Processing Function (box 63) compresses the ECG data by decomposing the two-dimensional data matrix into its singular values and singular vectors. The Subspace Processing Function then enhances the compressed data by modifying or eliminating some of the singular vectors. Prominent features, interference, and noise are suppressed and/or eliminated from the data. "The Subspace Processing Function allows Signal Processing Functions [box 64] to operate on compressed and enhanced ECG data, rather than the original data." Col. 8, lines 4-8. This results in a substantial reduction in the overall processing load of the Signal Processing stage.

The resulting compressed and enhanced left and right singular vectors L , R^t , are passed from the Subspace Processing Function (box 63) to the Signal Processing Function (box 64) for analysis of electrical alternates and ventricular late potentials. The Enhancement Function (box 65) expands the resulting selected data into an enhanced, three-dimensional form, which is then displayed by the Display Function 66.

The preprocessing function is described in length at col. 8, line 50 to col. 9, line 33. The subspace processing function is described in length at col. 9, line 35 to col. 11, line 21. The

signal processing function is described in length starting at col. 13, line 60 and ends at col. 14, line 54. The enhancement function is described in length starting at col. 14, line 56 to col. 15, line 48. The display function is described in length at col. 15, line 50 to col. 16, line 44.

Hutson does not teach or suggest claim 32. Rather, the Hutson reference is fundamentally different than the claimed invention. Moreover, the Hutson reference, because of these fundamental differences, does not provide any motivation for modifying its teachings to render claim 32 obvious. Accordingly, Applicants request withdrawal of the rejection and allowance of claim 32.

Claims 33-48 depend, either directly or indirectly, from claim 32 and consequently, include patentable subject matter for the reasons set forth above with respect to claim 32. Therefore, dependent claims 33-48 are allowable. Additionally, dependent claims 33-48 specify additional acts and/or limitations that, in combination with claim 32, are believed to be inventive. For example, the Examiner has indicated claims 39, 41-43, 45, and 46 include allowable subject matter. Additional discussion regarding some of the rejected dependent claims is provided below.

Applicants assert that Hutson does not teach or suggest the subject matter of claim 40 and that the subject matter of claim 40 is not obvious in view of the reference. Applicants request the Examiner to provide further discussion regarding claim 40 in order for the Applicant to better respond to claim 40.

The Examiner rejected claims 33-37 under 35 U.S.C. § 103 as being unpatentable over Hutson in view of U.S. Patent No. 5,819,007 (Elghazzawi). The Examiner asserts that the Elghazzawi reference teaches that it is old and well-known to analyze an ECG signal according to such methods as pattern recognition, neural networks, fuzzy logic, or Bayesian decision logic to anticipate possible cardiac problems. However, the claimed invention of claims 33-37 recites obtaining (N) voltages from (N) signals representing a physiological signal, converting the (N) voltages to (M) values, optimizing the (M) values to (P) values, and then classifying the (P) optimized signals. There is no teaching or suggestion by the combination of Hutson and Branham to classify optimized signals. Accordingly, dependent claims 33-37 include allowable subject matter.

CONCLUSION

Entry of the Amendment and allowance of claims 1-46 are respectfully requested. The undersigned is available for telephone consultation at any time during normal business hours.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Sheldon L. Wolfe". The signature is fluid and cursive, with the first name "Sheldon" being more prominent.

Sheldon L. Wolfe
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